

GAO

Report to the Chairman, Committee on
Government Operations, House of
Representatives

May 1987

AIR FORCE COMPUTERS

Development Risks of Logistics Modernization Program Can Be Reduced



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United States
General Accounting Office
Washington, D.C. 20548

**Information Management and
Technology Division**

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May 15, 1987

The Honorable Jack Brooks
Chairman, Committee on Government
Operations
House of Representatives

Dear Mr. Chairman:

This report completes our response to your March 25, 1986, request that we review the Department of the Air Force's Logistics Management Systems Modernization program and the acquisition strategy used in this procurement. The report makes recommendations to the Secretary of the Air Force for improving the management and control of the program.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of the report until 30 days from its issue date. At that time, we will send copies to the Chairmen, Senate and House Committees on Appropriations; Secretaries of Defense and Air Force; and other interested parties; and will make copies available to others upon request.

Sincerely yours,

A handwritten signature in cursive script that reads 'Ralph V. Carlone'.

Ralph V. Carlone
Director

Executive Summary

Purpose

The Air Force has initiated a new modernization program—the Logistics Management Systems Modernization program—to replace 94 of its more than 385 existing logistics management systems. These 94 systems, according to the Air Force, are the life's blood of its maintenance and supply operations. The estimated 8-year acquisition and operating cost of this program is \$1.5 billion, of which \$738 million is the acquisition cost. As of February 1987, the Air Force had obligated \$344.4 million, or about 47 percent of the acquisition cost.

Because of concerns about the continuing poor state of automation in the Air Force Logistics Command and past difficulties the Command has had in developing large systems, the Chairman of the House Committee on Government Operations asked GAO to determine whether the Air Force has

- taken actions to avoid repeating past system development problems,
- completed all initial project planning activities,
- established adequate project management and control procedures, and
- complied with the Brooks Act of 1965 as revised in the continuing resolution for fiscal year 1987 (Public Law 99-591).

Background

The Command's current logistics management systems were designed in the late 1950s and early 1960s. According to the Command, while these systems have been improved since their implementation, they have not kept pace with increasing information requirements. In 1966 the Command initiated a major system modernization effort called the Advanced Logistics System program, which was to replace 250 of the 376 systems that existed at that time. This program encountered major development problems and in late 1975, with \$250 million spent, was terminated by the Congress.

Subsequently, the Air Force initiated several projects that were designed to improve its logistics management systems. In November 1984, the Department of Defense decided to merge the nine most essential of these projects (representing 94 systems) into the Logistics Management Systems Modernization program. As of February 1987, seven of these projects were under contract for development and two were undergoing initial planning. The Air Force considers some project segments operational.

To reduce development risks and ensure that new systems are efficiently and effectively acquired, Defense and Air Force regulations require that

- acquisitions be planned to ensure that objectives are clearly defined and feasible alternatives are fully analyzed prior to initiating system development and
- management procedures be established to ensure control over cost, schedule, and performance.

Results in Brief

The Air Force has taken several actions to reduce the risk of a total program failure similar to that which occurred with the Advanced Logistics System. However, because the Air Force generally did not complete the required initial planning activities for the individual projects, it has not ensured that the most cost-effective alternatives are being pursued or that the projects as designed will correct existing system deficiencies and achieve expected benefits.

Also, the Air Force has not established the management procedures necessary to assure that the cost, schedule, and performance status of the projects are accurately measured. Although the Air Force has reported to the Secretary of Defense that the overall program will be completed within the original cost estimates, individual projects are beginning to experience cost increases ranging from 8 to 98 percent and schedule delays ranging from 6 to 65 months.

In initiating the program, the Air Force had determined that the projects were exempt from the Brooks Act and thus did not seek delegations of procurement authority from the General Services Administration. However, GAO believes that these projects are for routine logistics applications and, therefore, the Air Force should have sought such delegations. Further, under recent amendments to the Brooks Act, if a firm protests a future contract decision, a ruling could be rendered that a delegation is required.

Principal Findings

Avoiding Past System Development Problems

According to the Air Force, the Advanced Logistics System was an immense and complex undertaking. Its size and the attempt to develop the entire system as a single effort added to the complexity and created development problems. When the program encountered serious difficulties, the Air Force convened a panel of experts to study the situation. The panel found that, in addition to the size of the effort, the problems were caused primarily by (1) the lack of proven, commercially available software and (2) inappropriate computer hardware.

For the current modernization effort, the Air Force has reduced the risks that the overall developmental effort will fail, because the program is smaller in scope and is being managed as independent, less complex projects than the Advanced Logistics System. In addition, the program calls for the use of proven, commercially available hardware and software whenever possible. By designing the program in this manner, the Air Force reduced the risk of a large-scale, Advanced Logistics System-type failure. Planning and management weaknesses, however, have increased the potential that individual projects may fail or experience substantial cost increases, schedule delays, or performance degradation. (See pp. 16 to 19.)

Initial Project Planning

Defense regulations require potential users to complete a feasibility study and an economic analysis before acquiring a new computer system. A feasibility study should clearly identify existing systems deficiencies and alternative solutions. An economic analysis should define expected benefits, evaluate alternatives, and establish criteria and a systematic method for evaluating project success. GAO found that the Air Force approved eight of the nine modernization projects without feasibility studies. Although an economic analysis was completed for eight of nine projects, benefits were usually stated in general terms, were not properly quantified or supported, and were not tied to existing problems in the Command's operations. Without adequate planning, the Air Force cannot assure that the deficiencies of the current systems will be resolved or that expected benefits justify the cost of the program. In general, Air Force managers told us that these studies were not needed or they relied on alternative studies. We found that these alternative studies did not comply with Air Force planning regulations. (See pp. 20 to 26.)

Project Control

GAO identified weaknesses in management's ability to measure the progress and costs of the development projects. Although Department of Defense and Air Force acquisition policies require corrective action be taken when actual costs and milestones exceed planning estimates, GAO found that contractor cost and schedule status reports were not regularly validated and in some cases did not accurately reflect true project status. For example, on one project where the Air Force did validate the status report, it found that project costs were understated by \$2.1 million, 50 percent, and scheduled completion was 8 months later than indicated. At the time of the validation, the status report indicated that the project was close to completion and was within cost. As a result of this validation, the Air Force has directed that special cost and schedule validations be done for all projects. As of March 1987, however, no additional validations had been completed.

Cost and schedule validation is important because the Air Force is currently reporting that the overall modernization program is within its estimated cost of \$738 million, even though five of the nine projects have schedule delays. Until a proper validation effort is performed on each project, GAO believes that the Air Force cannot support its overall assessment of the program's status. (See pp. 26 to 32.)

Brooks Act Requirements

In GAO's opinion, the modernization projects are for routine logistics applications and as such should be subject to the Brooks Act. As a result, GAO believes the Air Force should have requested delegations of procurement authority from the General Services Administration. While the Department of Defense has stated that it believes these delegations to be unnecessary because the projects go beyond routine logistics applications, GAO believes that it would be prudent for Defense to obtain these delegations to avoid potential program delays. Under the October 1986 amendments to the Brooks Act, if a firm protests a future contract decision, a ruling could be rendered that a delegation is required. This might result in program delays that the Air Force could have avoided by seeking delegations before taking further contract actions. (See pp. 32 to 35.)

Recommendations

GAO recommends that the Secretary of the Air Force direct the Commander of the Logistics Command to take the following actions:

- Ensure that existing problems in the Command's operations and expected benefits are properly identified and used to establish criteria

and a systematic method for evaluating project success. This should be expeditiously completed for the seven projects under contract. For the two remaining projects, the above actions and an assessment of alternative solutions should be completed before awarding the contracts.

- Establish control and oversight procedures to routinely validate that cost, schedule, and performance tracking mechanisms accurately reflect program status, and promptly report changes in the cost and schedule estimates resulting from this validation effort to the Secretary of Defense and to the Congress.

In order to avoid potential program delays, GAO also recommends that the Secretary of Defense direct the Secretary of the Air Force to obtain delegation of procurement authority from the General Services Administration for the Logistics Management Systems program before further contract actions are taken.

Other GAO recommendations aimed at improving the modernization program are on pages 37 and 38.

Agency Comments

GAO did not request official agency comments on a draft of this report. However, during the course of its work, GAO discussed key facts in this report with agency program officials and has incorporated their comments where appropriate.

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Abbreviations

ALS	Advanced Logistics System
GAO	General Accounting Office
LMS	Logistics Management Systems Modernization program

Introduction

The Air Force Logistics Command has initiated a program to replace 94 of its more than 385 existing logistics management systems with more modern systems. The program is called the Logistics Management Systems Modernization (LMS) program. Because of past problems the Air Force has had in acquiring and developing logistics systems, the Chairman of the House Committee on Government Operations asked us to review LMS to determine whether the Air Force has taken steps toward ensuring program success.

Air Force Logistics Command's Modernization Efforts

The Air Force Logistics Command provides the logistics support necessary to keep United States Air Force units and weapon systems in a state of readiness and to sustain their operations in peace and war. It also supports other Defense organizations, federal agencies, and foreign nations. In providing this support, the Command determines customer requirements; acquires items and services; stores and distributes stock; and maintains, modifies, and repairs weapon and support systems. The Command, which employs over 100,000 personnel and administers \$113 billion in capital assets, is located in Command headquarters, five Air Logistics Centers, and three specialized organizations. It operates on an annual budget of nearly \$16 billion, acquiring, storing, transporting, and repairing over 915,000 items managed by the Air Force.

The Command has long relied upon computer technology to provide the enormous amounts of timely and accurate information needed to accomplish its mission. Over 385 automated logistics management systems, many of which were designed in the 1950s and 1960s, are used to collect and process data for decision-making, record-keeping, and reporting; to conduct operations, such as computing spare parts requirements and ordering materiel; and to link commodity, weapon system, and geographic information, integrating it with Air Force and other Defense organizations.

Current Modernization Program

In November 1984, the Air Force initiated LMS to fulfill a long-standing need for modern automated logistics information systems. The program was to include the latest computer technology and management science techniques and was to be based on clearly defined logistics information requirements. The program consists of nine major, discrete acquisition projects designed to modernize different aspects of the logistics management systems. Each of these projects has its own cost, schedule, and performance parameters. According to the Air Force, these nine projects

were merged into one program to facilitate managing and budgeting and to allow more concise reporting on project status to the Congress.

Overall, LMS will modernize current logistics operations by replacing 94 existing computer systems, automating manual operations, and changing from batch¹ to on-line,² real-time³ processing procedures. Although the 94 systems being replaced are only a portion of the more than 385 logistics systems, the Command believes they are the life's blood of its logistics operations because they handle requirements forecasting, materiel acquisition and control, and direct maintenance and support of its aircraft and other equipment. For these reasons, the Congress has endorsed this program believing it will enhance the Air Force's readiness and sustainability. Table 1.1 identifies and briefly describes the objectives of each of the nine LMS projects. Appendix I contains more detailed information on each project.

¹Batch processing refers to data accumulated over a period of time and then submitted to the computer for processing. The user generally cannot interact with the computer as the data is being processed.

²On-line refers to a user's ability to access and interact with a computer via a terminal.

³Real-time refers to the processing of data by a computer at the same time information is being keyed in.

Table 1.1: The LMS Projects

Dollars in millions		
Project title and description	Estimated completion date	Estimated costs (Funds obligated as of Feb. 1987)
Requirements Data Bank:		
Computes quantities required and prepares budgets for material to support weapon systems and other equipment.	April 1994 ^a	\$151.0 (\$91.3)
Weapon System Management Information System:		
Assesses war capabilities, levels of combat operations, and solutions for readiness and sustainability problems.	September 1987 ^a	46.0 (34.1)
Contracting Data Management System:		
Brings together information for buyers and contracting officers to manage contract actions.	June 1990 ^b	48.2 (4.3)
Stock Control and Distribution System:		
Controls the storage, allocation and movement of inventories	January 1989 ^a	197.6 (79.3)
Enhanced Transportation Automated Data System:		
Provides airlift, seairlift, and truck service information, and in-transit control of selected items.	September 1987 ^a	10.9 (6.3)
Depot Maintenance Management Information System:		
Integrates management of depot repair functions.	October 1990 ^b	106.2 (16.5)
Engineering Data Computer Assisted Retrieval System:		
Automates requisitioning, indexing, filing, retrieval, and distribution of technical engineering drawings.	October 1987 ^a	32.7 (29.7)
Local Area Network:		
Provides terminal-to-computer and computer-to-computer communications within and among sites and between systems.	July 1990 ^a	127.3 (66.7)
Intersite Gateway:		
Provides communications link with Air Force, Defense, and contractor sites	June 1988 ^a	18.0 (16.2)
Totals		\$737.9^c (\$344.4)^b

^aCurrently under contract for development.

^bContract yet to be awarded.

^cDoes not include \$53.7 million for three support programs and one canceled project.

The Air Force is developing each of the nine modernization projects incrementally using contractor rather than in-house resources. In February 1987, when we completed our review, seven were under contract

for development and initial planning had begun on the other two. Contracts had not been awarded on these two. The total estimated acquisition costs for the overall modernization program, including hardware and software development, are \$738 million, and the life cycle cost estimate, including 8 years of operation and maintenance, is \$1.5 billion.

The Command's Past Modernization Effort—the Advanced Logistics System

The current program is not the Command's first major attempt at modernizing its logistics management systems. In 1966, the Air Force initiated an automated information and data processing development program called the Advanced Logistics System (ALS). This program was also designed to improve logistics management by using the latest computer technology and new management science techniques. It was to provide logistics managers with ready access to all available data from a common data base, thus allowing them to make more prompt and accurate decisions. The program was to replace approximately 250 of the 376 data systems that existed at that time.

ALS was to be acquired under a centralized design concept using both in-house and contractor resources. The Air Force estimated a life-cycle cost of about \$821 million to develop, implement, and operate the system through fiscal year 1979. Under a fixed-price, fixed-quantity contract awarded in April 1972, the contractor was to provide the computer equipment and develop operating system software and a single data bank. Concurrently, the Air Force was to develop applications software and the central control system which links the applications with the contractor's software. Originally, because of its high degree of integration, a complete "turn-key" implementation was planned. That is, all replaced systems would be discontinued with simultaneous full implementation of the new system in 1972. When completed, ALS was to result in more economical computer operations, a reduction in Air Force inventories, and reductions in staff of more than 3,600 slots. Net tangible savings were projected to exceed \$350 million in staff costs and spare parts inventory reductions.

In December 1975, after 9 years of work and the expenditure of about \$250 million, the House and Senate Committees on Appropriations instructed the Air Force to terminate the ALS program. At that time, computer equipment and software problems were preventing the Air Force from achieving the original program objectives, and the Air Force estimated it would need \$563 million to resolve problems and complete the program. In addition to terminating development, the Committees directed the Air Force to (1) determine what management information it

needed to improve logistics support for its mission responsibilities and (2) design and develop a new automated logistics system based on the latest computer technology to meet long-term information needs. Although the Air Force has undertaken several smaller efforts to upgrade its information systems, LMS, initiated in November 1984, is the first large consolidated effort to modernize key logistics systems since that time.

Objectives, Scope, and Methodology

In a March 25, 1986, letter, the Chairman of the House Committee on Government Operations raised concerns about the continuing poor state of automation in the Air Force Logistics Command and past difficulties the Command has had in developing large systems. On the basis of this request and subsequent discussions with the Chairman's office, our objective was to determine whether the Air Force has taken sufficient actions to reduce development risks, thereby increasing the chances of success for this program. Specifically, we were to determine whether the Air Force

- took actions in the current modernization program to avoid a large-scale development failure similar to the one that occurred with the ALS program over 10 years ago;
- completed initial planning activities to ensure that projects were clearly defined, alternatives were fully assessed, and criteria were established to measure project success;
- established adequate project management procedures to measure and control the development of projects; and
- took actions to comply with the Brooks Act of 1965 as revised in the continuing resolution for fiscal year 1987 (Public Law 99-591).

To determine if the Air Force has taken actions to avoid a development failure similar to ALS, we reviewed past Air Force assessments and GAO reports to identify the major causes of this failure. For comparison purposes, we assessed the development and acquisition plans, contracts, and documentation of the nine LMS modernization projects, and interviewed appropriate agency officials to characterize project size, scope, complexity, and acquisition strategies.

To determine the adequacy of the Air Force's design and management of the nine projects, we reviewed Defense and Air Force automation and contracting policies and requirements, evaluated project acquisition strategies and development plans, and interviewed responsible Air Force officials.

We also examined initial planning documentation for each of the nine projects to determine if the Air Force had adequately defined the operational deficiencies to be resolved and the benefits to be achieved. Project management procedures were examined to determine if review and documentation requirements were being met. Checklists were developed to compare Air Force actions to those required by Defense and Air Force regulations. To identify additional actions the Air Force could take to reduce cost, schedule, and performance risks, we reviewed development contracts and status reports used to control and measure project status. We evaluated the adequacy of these documents, using federal and private industry guidance and through interviews with agency officials.

We collected Air Force cost and schedule data for each of the nine modernization projects. We did not, however, independently assess the validity of this data or the status of the projects. Because the Air Force reported that some project segments were operational, we interviewed users at two of the Air Force's five air logistics centers to determine their views on the effectiveness of these systems.

Our review was conducted from May 1986 to February 1987, primarily at the Air Force Logistics Command's Logistics Management Systems Center and the LMS project offices at or near Wright-Patterson Air Force Base, Dayton, Ohio. We also visited Air Force headquarters in Washington, D.C.; the Air Force Audit Agency and Aeronautical Systems Division of the Air Force Systems Command at Wright-Patterson Air Force Base; the Defense Systems Automation Center in Columbus, Ohio; and the Air Logistics Centers at San Antonio, Texas, and Oklahoma City, Oklahoma.

We discussed key facts with Air Force Logistics Command officials and have included their comments where appropriate. However, in accordance with the requester's wishes, we did not obtain official agency comments on a draft of this report. Except for this, our work was performed in accordance with generally accepted government auditing standards.

Air Force Has Reduced the Risk of Total Program Failure

ALS was an immense and complex undertaking. The sheer size and the attempt to develop the entire system under a single development effort added to the complexity and created development problems. When the program encountered serious difficulties, the Air Force convened a group of 126 Air Force, industry, and academic experts to study the problems. This group found that, in addition to size and complexity, ALS problems were caused primarily by a lack of proven software and use of improper hardware.

In its latest effort to modernize its logistics management systems, the Air Force has undertaken a strategy which, by its nature, is less risky than that used in the ALS program. It is, for example, smaller in scope and less complex than the ALS program and is divided into nine separately managed projects. Consequently, even if there are individual failures among the nine LMS projects, the Air Force should not experience a complete ALS-type program failure. In addition, the current modernization effort will extensively use proven, commercially available hardware and software.

LMS Is Smaller in Scope and Less Complex Than ALS

The LMS modernization process is broken into nine components that allow for better control in project planning, development, and implementation. The Air Force believes that even if some of these projects fall short of expectations, the overall modernization effort should not fail as it did when ALS was terminated.

In 1964, the Air Force was operating about 375 logistics data systems on approximately 130 computers. Each of these data systems had been designed to meet particular requirements carried forward from previous manual systems and was partially overlapping and redundant. Recognizing that recent improvements in computer technology could offer new ways to store and retrieve data, the Air Force, in 1966, initiated the ALS program. This program was an immense undertaking that was supposed to integrate about 250 existing logistics systems into one system capable of simultaneously providing current, meaningful logistics information to all management levels. According to the Air Force, a project of this size and complexity had never before been attempted.

Under the acquisition strategy employed by the Air Force, the ALS program would have resulted in an entirely new information system with seven new, large computers and over 2,000 remote terminals. It was to be an on-line system that would allow users to obtain specific transaction-oriented information from a single, integrated data base. Because of

this high degree of integration, the Air Force originally anticipated that all the replaced systems would be discontinued simultaneously with ALS implementation. As problems arose during the system's development, however, the Air Force, by necessity, dropped this concept (commonly called "turn-key").

In contrast to ALS development, the LMS program is nine individual projects that the Air Force, primarily for budgeting and control purposes, combined into one program. These nine projects were individually approved by the Air Force and each is to have its own data base; project management structure; and cost, schedule, and performance parameters. The Air Force selected this approach as a reasonable way to modernize its logistical systems, considering the past failure of the large, single-data-base, ALS concept.

LMS Will Use Commercially Available Hardware and Software

The Air Force intends to use only mature, proven hardware and software for its LMS program. In this way, it should avoid some of the pitfalls encountered with the ALS program.

The first ALS computer was delivered to the Air Force in April 1972. When serious problems arose with the equipment (hardware) and with the software that was being developed, Air Force management attempted to make corrective actions, but were not successful. In September 1974, the Air Force suspended work and formed a group of 126 Air Force, industry, and academic representatives to comprehensively assess the ALS program. They reviewed 11 major ALS areas and reported their findings in a report entitled Advanced Logistics System Assessment.¹ According to this and two other reports,¹ ALS failed primarily because (1) the computer hardware was not suited for the system's requirements and was not sufficiently reliable and (2) the software was new and unproven and lacked the controls necessary to ensure data accuracy.

More specifically, these reports stated that the hardware selected by the Air Force was designed more for scientific uses and was not suitable for the business-related functions involved in manipulating the massive amounts of logistics data. In addition, the hardware reportedly lacked certain built-in features that help ensure data accuracy and prevent

¹The Advanced Logistics System, Charles K. Bowden, Air War College Air University, April 1976, and Problems in Developing the Advanced Logistics System (GAO LCD-75-101, June 17, 1976).

data from being lost due to a power outage or some other type of computer shut down. This last point was particularly important because, between September 1973 and June 1974, the ALS computer hardware that had been put into use was shut down over 60 times, each in excess of 15 minutes. According to the task group's report, these shut downs could have resulted in a loss of data had the system been fully operational.

The reports on ALS's failure also noted that there was no proven, commercially available software suitable for ALS requirements. According to these reports, this created several problems that ultimately contributed to the system's failure. First, the operating system software⁵ and data base management system software⁶ developed by the ALS contractor was immature. This means that the software had not been proven in an operating environment, likely included errors, and was unreliable. Second, the applications software,⁷ which was being developed by the Air Force, excluded various features, such as edit checks, that improve data reliability. As best we can determine from the information in the Air Force reports, the Air Force consciously excluded these features because they would have reduced the system's operating speed, an important aspect of the program. Third, the complexity of the project was magnified because the Air Force was developing the applications software concurrently with the contractor's development of the operating system and data base management system software.

Because of these types of hardware and software problems, the Air Force concluded that the ALS system would not be reliable enough to perform all its operational requirements. For example, at best during testing, the ALS system was up and running about 75 percent of the time. This compares to a 90-percent reliability level required by the Air Force contract, and a 99-percent level the task force report said would have been needed to fully meet the ALS operational requirements. In April 1975, the Air Force approved a \$563 million "get well plan" to resolve these problems. This plan was not acceptable to the House and Senate Committees on Appropriations, and on December 10, 1975, ALS was terminated.

⁵A group of computer programs that monitors and controls the operation of a computer system while the application programs are running.

⁶Computer programs that facilitate the management, manipulation, and control of an organization's repository of data.

⁷Computer programs designed to accomplish a specific job or application, such as payroll computation, inventory control, and accounting.

In initiating the LMS program, the Air Force has taken steps to reduce the risk of failure by purchasing only mature, commercially available hardware and software. This should resolve two of the specific problems attributed to the ALS failure. First, mature, commercially available hardware and software have already been proven in an operating environment. They are highly reliable and include specific features that ensure data accuracy and prevent data loss. For example, most computer systems in operation today include a restart and recovery feature. After a computer shuts down, this feature saves the data and performs other functions that allow the computer operator to quickly reestablish normal operations. Such features should resolve many of the reliability problems experienced with ALS. Second, the availability of mature, commercially proven operating system and data base management software means that the Air Force only needs to develop the applications software. This has significantly reduced the complexity and the overall risk of LMS's development.

In addition, the Air Force has directed its development contractors to select only hardware that will meet the specific operational requirements of each project. This was done to avoid ALS reliability problems caused when the Air Force procured scientific hardware that was unsuitable for processing large amounts of logistics data. While this has reduced the risk of a total program failure, it has also increased the difficulty of integrating the various logistics systems—a long-term Air Force goal. Under the current acquisition strategy, the Air Force is allowing the development contractor for each project to purchase its own hardware, based on the specific requirements of each system being developed. This strategy complicates the integration process. Recognizing this difficulty, the Air Force (1) is requiring its contractors to consider potential integration problems as they design the new systems and (2) has hired a contractor to establish design specifications for integrating LMS and to act as the integration agent. The Air Force plans to hire other integration contractors from time to time, when tasks and procedures arise that require specialized skills, such as telecommunications or data base management.

LMS Project Development Risks Could Be Further Reduced

Historically, the Department of Defense has had problems developing large computer information systems. Many of these systems have exceeded their original cost estimates and have failed to perform as planned. Consequently, over the past several years, Defense and the Air Force have established more stringent requirements for acquiring automated information systems. This guidance emphasizes the importance of adequately planning for acquisition and controlling the program's cost, schedule, and performance. In addition, the Brooks Act requires agencies, including Defense in some cases, to request a delegation of procurement authority from the General Services Administration. This action is supposed to provide an independent assessment of whether the procuring agency has performed all the initial planning activities prior to authorizing the acquisition of the system.

We found that the Air Force generally did not complete the required planning activities prior to initiating development of LMS projects. Air Force officials told us that they viewed planning as an exercise needed for funding approval, not as a tool to help better manage the projects. In addition, the Air Force considered LMS projects exempt from the Brooks Act under the Warner Amendment, 10 U.S.C. 2315, and, as such, did not request a delegation of procurement authority from General Services. Further, once in development, weaknesses in project management inhibited the Air Force's ability to measure and control contractor performance. As a result of these planning and management weaknesses, the Air Force has, in our view, increased the potential that the projects will incur significant cost increases and schedule delays, and that completed systems may not perform as planned.

Initial Planning Activities Not Completed

Defense Directive 7920.1 and Air Force regulations, 300 series, require that specific planning activities be completed as the initial step in the acquisition of automated systems. These planning activities help ensure that systems are designed, developed, evaluated, and operated in an effective manner at the lowest cost. According to Air Force regulations, two of the most important planning activities are the preparation of a feasibility study and an economic analysis.

We found that the Air Force initiated development of the nine LMS projects without always conducting feasibility studies or properly completing economic analyses. As a result, the Air Force did not clearly analyze the existing problems in its operations, identify alternatives for correcting these deficiencies, or define the benefits and costs of each alternative. This basic planning information is needed for the Air Force

to ensure that the alternatives it selected to resolve its existing operational deficiencies were the most cost effective. Moreover, clearly defined benefits would provide the Air Force with a basis for establishing criteria to measure successful project completion.

Most Feasibility Studies Not Done

As a first step, Air Force regulations require a feasibility study to evaluate the agency's current way of doing business, identify problems and opportunities for improvement, and offer alternative solutions for management's consideration. This information is critical to the system acquisition process because it guides and supports early project decisions that shape project costs and system usefulness. Air Force regulations emphasize the importance of feasibility studies because they provide information for deciding whether to acquire new equipment or merely improve on existing processes or procedures.

The Air Force did not do feasibility studies for eight of the nine LMS projects. For the one project with a completed feasibility study, the analysis was insufficient and was later supplemented with a more detailed study.

Air Force's Reasons for Not Completing the Feasibility Studies

Air Force officials gave different reasons why the studies, though mandatory, were not done. In general, officials responsible for the projects' development said that these studies were not necessary to obtain project approval and, therefore, were not done. Anticipated system users responsible for preparing the studies, in some cases, did not seem to fully understand the importance of the studies and, in other cases, believed they fulfilled the objectives of the studies through other efforts. Some examples follow:

- Project officials of the Depot Maintenance Management Information System said they relied on a planning document the Air Force prepared for the overall LMS program. In our opinion, this document provides a general overview of the Air Force's current operations, desired changes, and preferred approaches for making these changes. It does not, however, include the specific planning information required by Air Force acquisition regulations to fulfill the objectives of a feasibility study. The LMS planning document also clearly states that each LMS project must be specifically justified and acquired on its own merit.
- Project officials of the Weapon Systems Management Information System told us that they did not see a need for a feasibility study. They said their project was a combination of several previously approved

projects, the deficiencies were well-known, and there was a low risk of failure. We noted, however, that Defense regulations require initial planning documents be amended and revalidated when there is a change in the selected alternative or a major modification to the alternative.

- Project officials of the Requirements Data Bank relied on a systems engineering management plan to define the system's overall concept and acquisition strategy. However, this plan did not evaluate the current way of doing business, identify existing problems in the operations, or present alternative solutions to correct these problems as required by regulations.
- Project officials of the Enhanced Transportation Automated Data System told us that the feasibility study for their project had been waived. They were, however, unable to document the waiver or identify who had approved the waiver.

Because feasibility studies were not done, we were interested in determining if problems in the Command's operations were, in fact, being corrected. Although none of the eight projects are totally operational, we visited two of the Air Logistics Centers where the Air Force Logistics Command said some project segments were being used. We observed that for one Requirements Data Bank project segment, users were generally not using the system because the data were up to 3 months old. Instead, users said they relied on the old system because the data were only a week old. Although neither system was considered adequate because users felt they needed overnight updates, the old system's data were at least more current than the new system's data.

Users of a segment of the Weapon Systems Management Information System also told us they needed overnight updates but, in some cases, were receiving information that was up to 2 weeks old. As a result, these users had developed separate programs for their personal computers, called various people to update data, and entered the data into their programs. Similarly, for two other project segments which the Air Force considered operational, users told us that the programs were of no value because they seldom worked. They stated that even when the programs were running, the response times were 24 hours or longer, too slow to be useful.

Completed Feasibility Study
Insufficient

For one project, the Contracting Data Management System, a feasibility study was completed during initial project planning in 1983. Although this study was revised in May 1986, it did not provide a detailed analysis of current operational deficiencies and user needs as required by

Air Force regulations. Realizing the inadequacy of the feasibility study, project officials, in July 1986, began an information engineering study to obtain the detailed planning information that should have been provided by the feasibility study. They expect this effort to save considerable development time once a contract is awarded. It should also help ensure that the system developed by the contractor will meet user needs.

In addition to not fully analyzing deficiencies and user needs, the May 1986 Contracting Data Management System feasibility study did not fully explore alternatives to the proposed solution of developing a new system. Although we did not attempt to identify alternatives for each of the nine projects, we believe that, on the basis of prior GAO work,⁸ the Acquisition Management Information System, developed by the Air Force Systems Command in 1976, appeared to be similar to the proposed system. Both are automated contract administration and payment systems. The Acquisition Management Information System has, however, been operational for 10 years and the Contracting Data Management System is yet to be developed. Systems Command officials told us that their system presently meets 56 of the 72 stated requirements established by the Logistics Command. Systems Command officials also stated that with modification, the remaining 16 requirements could be satisfied. On the basis of our suggestion, Contracting Data Management System project officials agreed to explore the use of the Systems Command's existing contract system as a less costly alternative to developing a new system.

Economic Analyses Inadequate

An economic analysis builds on the information that should be provided in a feasibility study. Once feasible alternatives for correcting existing operational problems have been recommended in the feasibility study, an economic analysis is done to identify and compare the economic implications of each alternative. The analysis includes assumptions and constraints associated with the various alternatives. The analysis also includes the estimated cost of each alternative. In addition, Air Force acquisition regulations state that the analysis should clearly define benefits and quantify the degree to which each alternative resolves current operational problems or provides operational improvements. An economic analysis assists management in selecting the best alternative for improving operations; it is one of the principal tools for providing project direction and control.

⁸System Effectiveness Making Air Force's Acquisition Management Information System More Useful (GAO/IMTEC-87-11, March 11, 1987).

We reviewed the eight project analyses that had been completed to determine whether required information had been included. Although we did not independently evaluate and verify all of the information or supporting documentation contained in the analyses, we found that the Air Force (1) did not always quantify expected benefits as required and (2) did not establish evaluation criteria to measure the projects' success in achieving those benefits.

Officials of the one project without an economic analysis, the Enhanced Transportation Automated Data System, told us that, like the feasibility study, the requirement for an economic analysis had been waived for their project. They were, however, unable to document the waiver or identify who had approved the waiver.

Benefits Not Adequately
Quantified

Air Force regulations require that all benefits be quantified. Benefits should be stated in sufficient detail to clearly define the extent to which they will correct the deficiencies of the existing systems and improve the operation of the Command. According to the regulations, benefits must, therefore, be clearly linked to deficiencies. When feasible, benefit statements should identify specific budget line items that can be reduced once the proposed system becomes operational.

Six of the eight economic analyses did not include an adequate quantification of expected benefits. For example, a stated benefit of the Contracting Data Management System was that it would provide "reduction of errors." This stated benefit is typical of the six projects for which benefits are not quantified. It does not quantify the current error rate, does not identify an acceptable error rate, and does not identify the expected improvements that will result if the acceptable rate is achieved. As a result, the Air Force cannot determine if the selected alternative is the most cost-effective solution, the degree to which the alternative will resolve the problem, or the extent to which this resolution will adversely impact the Command's mission.

Because benefits were not clearly defined in the economic analyses, we asked the Air Force to provide a statement of projected benefits for each LMS modernization project. The Air Force's response did not provide any better definition of benefits than were in the economic analyses. Air Force officials said they could not improve on the stated benefits at that time, but would continue to refine the impact of the benefits as the projects progress.

Even though all benefits were quantified for both the Engineering Data Computer Assisted Retrieval System and Requirements Data Bank projects, we questioned the validity of these quantifications. For example, in a recent report,⁹ we found that the Air Force overstated the benefit for the Engineering Data Computer Assisted Retrieval System project by \$1.4 million. Also, stated benefits were supported by information from only one of the five planned operational sites. In our current review we found that, with respect to the Requirements Data Bank project, the Air Force did not adequately support information in the economic analysis. Stated benefits were generally supported only by broad, generalized statements from mission personnel who had knowledge of less than half of the 19 automated systems to be replaced.

Project Evaluation Criteria and
Plans Not Established

Defense directives on system acquisitions require that projects be evaluated to ensure that established goals and objectives are attained. Criteria to make these evaluations must be clearly specified at the inception of the project and are to be formalized soon after project approval in a final operational evaluation plan. Air Force guidance requires that these criteria be contained in the economic analysis.

None of the eight economic analyses we reviewed contained the criteria to be used for measuring the degree to which the project would resolve current operational problems. Reasons for not including this information varied. For example, project officials of the Weapon Systems Management Information System and Stock Control and Distribution System stated that the criteria were not required for their projects.¹⁰ Project officials of the Requirements Data Bank project told us that they could not explain why their economic analysis did not include this information.

We also found that officials responsible for eight of the nine projects had not established formal operational evaluation plans. Officials of four projects told us that they planned to measure how well their systems resolved current problems but had not yet identified a measurement method. Officials of two projects said that they planned to send questionnaires to system users for their opinions on project success, rather than develop a specific method to measure deficiency correction

⁹Data Management: DOD Should Redirect Its Efforts To Automate Technical Data Repositories (GAO IMTEC-86-7, March 13, 1986)

¹⁰Air Force Regulation 300-12, Air Force Logistics Command Supplement 1, specifically requires that the economic analysis include both the measurement criteria and benefit tracking system.

and benefit achievement as required. Officials of one of the remaining two projects told us that they did not plan to measure project success. Officials of the other project said that they plan to contract for a measurement system. Each of these responses, in our opinion, indicates that the criteria and method for evaluating project success have not been adequately addressed.

Only one project to date, the Stock Control and Distribution System, has an established evaluation plan. A prior GAO review of the Stock Control and Distribution System found that measurement criteria were not included in the project's economic analysis. Project officials agreed with the GAO finding and subsequently established a benefit tracking system with measurement criteria. They estimated that the system took 3 days to initially develop. It tracks 98 auditable factors, such as benefits to be provided and current operational problems to be resolved. Project officials told us that this benefit tracking system allows them to tie project benefits to specific budget items that will be reduced once the Stock Control and Distribution System is operational. These reductions are expected to account for more than the project's estimated acquisition cost.

Inadequate Management Controls Further Increase Risks

Air Force acquisition regulations recognize the necessity for strong project management to control cost increases, avoid schedule delays, and correct unsatisfactory system performance in the acquisition of automated systems. The Air Force has not, however, in all cases, taken the actions it could to strengthen the LMS modernization program management. As a result, inadequate quality assurance provisions in some software development contracts, insufficient cost and schedule tracking mechanisms, and incomplete management reviews have increased development risks by reducing the project managers' capability to quickly identify development problems and take corrective actions.

Development Contracts Lack Quality Assurance Provisions

Defense and Air Force contract guidance does not include specific provisions necessary to avoid common software development problems with respect to quality assurance. The Department of the Army has, however, published guidance that is specific. Accordingly, we used the "Army Guidance for Software Development Contracting" to assess the adequacy of quality assurance provisions included in the LMS development contracts or Requests for Proposals.

This Army guidance identified 53 individual measurable tasks, development milestones, and quality assurance provisions needed to ensure that quality software is developed. Of these 53 provisions, 13 address measurable tasks, such as system design, programming, testing, system documentation, and user training, on the system. Eighteen of the provisions relate to measurable development milestones for system analysis, design, programming, testing, and implementation. The remaining 22 provisions address performance standards that define technical evaluation criteria, establish inspection and test procedures, and provide acceptance criteria.

Our examination showed that the contracts or Requests for Proposals for four of the eight contracts contained most of the individual control provisions called for in the Army guidance. The other four projects, however, contained many contract weaknesses. For example:

- The Weapon Systems Management Information System contract did not include milestones for conducting major program reviews, provisions for meeting anticipated future growth requirements, or Air Force criteria for accepting the system.
- The Engineering Data Computer Assisted Retrieval System contract did not define design, analysis, and programming tasks; include milestone completion dates; or establish testing and periodic progress reporting.
- The primary Contracting Data Management System contract did not require the contractor to develop a quality assurance program or prepare periodic progress reports, and did not include Air Force criteria for accepting the system.
- The Requirements Data Bank contract did not identify requirements for testing, meeting anticipated future growth and requirements, or quality assurance.

We asked the contracting officer involved with four of the projects why the controls provided in the contracts varied so widely. We selected this contracting officer because three of the projects he was responsible for contained most of the control provisions, while one had significant weaknesses. This contracting officer told us the following:

- Specific contract contents were primarily determined by individual project managers.
- The Air Force has not established specific guidelines for software development contracting.

- There is no formal training for program managers on how to properly contract for software development. Therefore, project managers must rely on their prior experience.
- The concurrent development of LMS projects reduces the opportunity for using “lessons learned.” Additionally, no one is charged with documenting and maintaining lessons learned information. Project managers learn of mistakes on current and prior projects by word of mouth.

The recent Request for Proposals of the Depot Maintenance Management Information System project included most of the individual control provisions called for in the Army guidance. This request was prepared by the prior project manager of the Requirements Data Bank project and the head of the LMS contracting division, both of whom have many prior statements of work for the modernization program. Additionally, the Deputy Chief of Staff for Information Systems of the Command told us that the Depot Maintenance Request for Proposal was rigorously reviewed with his active participation. He also stated that all future Request for Proposals of LMS projects will undergo his close scrutiny and will be as good if not better than the one for the Depot Maintenance Management Information System.

Cost and Schedule Tracking Mechanisms Are Inadequate

The Department of Defense and the Air Force have established system acquisition policies that require corrective action be taken when actual project cost and schedule milestones exceed planning estimates by established thresholds. These requirements are designed to be a control mechanism to provide early warning signs of cost and schedule problems and to help ensure that systems are effectively developed at the lowest overall cost. Project managers must track actual costs and progress against approved project plans. The Chief of the Command’s Financial Management Division, Directorate of Program Management, is required to assist project managers in financial matters such as planning, implementing, and tracking project achievements. The Division’s responsibilities for projects requiring Cost Schedule Status Reports include analyzing contractor costs and schedule data for performance measurement, identifying cost deviations and schedule slippages, and initiating corrective action.

Our review of cost and schedule tracking for the modernization projects showed that only the Enhanced Transportation Automated Data System project had been analyzed in detail. The Chief of the Financial Management Division gave various reasons why the cost and schedule reports

for the remaining eight modernization projects had not been validated by his office:

- Cost Schedule Status Reports are not required for the Intersite Gateway System, Weapon System Management Information System, and Engineering Data Computer Assisted Retrieval System projects because they are being developed under firm-fixed-price contracts.
- The Local Area Network project is being managed by the Electronic Systems Division of the Air Force Systems Command, thus that office is responsible for monitoring project cost and schedule.
- Cost and schedule data for the Depot Maintenance Management Information System and Contract Data Management System projects are not monitored because they are not yet under contract. Once the contract is let, the Air Force plans to monitor them.
- Cost and schedule reports for the Requirements Data Bank and Stock Control and Distribution projects have not been evaluated in detail because these projects have been restructured.

Defense and Air Force regulations do not require cost and schedule reporting under firm-fixed-price contracts on the premise that the contract itself ensures the government of contractor performance. The Financial Management Division Chief told us that, in his experience, this premise does not always hold true. A contractor will sometimes expend contract funds before completing the project. The contractor may then refuse to continue the work, preferring to default rather than suffer a loss. The government usually increases the contract funds to cover the additional work. The Command's Deputy Chief of Staff for Information Systems told us he directed, in December 1985, that Cost Schedule Status Reports be implemented for all future projects. He did not, however, make this directive retroactive to existing contracts.

Three contractors are currently providing Cost and Schedule Status Reports. We found, however, that this data was not always accurate. For example, we analyzed contractor-provided cost and schedule data during a review of the Requirements Data Bank project and identified what appeared to be unreported variances between successive cost estimates. We discussed the results of our analysis with the Air Force during this review. In October 1986, the Air Force's Directorate of Program Management initiated a special validation of the Requirements Data Bank Cost Schedule Status Report to determine whether costs were properly distributed and differences in estimates adequately explained. Specifically, the Directorate found, among other things, that

- costs were charged against accounts that were closed because required work had already been completed;
- unallocated funds were used to cover cost differences when actual costs exceeded estimated costs; and
- revised cost estimates for project completion were inconsistent with the contractor's performance history.

The contractor disagreed with the Directorate's findings, stating that the discrepancies were, for the most part, due to changes caused by the project's evolutionary nature and by advance cost agreements with the Air Force. Succeeding actions demonstrated the magnitude of the disagreement. The contractor's December 1986 Cost Schedule Status Report for the Requirements Data Bank project showed the development to be on schedule. However, the Air Force, in February 1987, redirected the project and extended the development for 5 additional years.

The Air Force did another special validation in October 1986 to determine whether the Enhanced Transportation Automated Data System project could be completed within the funding levels and schedule being reported by the contractor. The validation disclosed that the contractor cost and schedule data was in error. The contractor estimated the project would be completed with less than a month schedule slippage and \$133,000 cost overrun. However, the Air Force estimated an 8-month slippage and a \$2.1 million, or 50-percent, cost overrun.

In our opinion, these validations are strong indications that cost and schedule status reports are not providing project management with adequate information with which to effectively measure contractor performance. The Chief of the Financial Management Division told us that since the Enhanced Transportation Automated Data System validation, the Air Force has recognized a need to validate the cost and schedule estimates of all LMS modernization program projects. The Deputy Chief of Staff for Information Systems told us that he has directed that special cost and schedule validations be done for all projects by applying a commercial computer modeling technique. As of March 1987, however, no additional validations had been completed.

We believe that the validation efforts are important because the Air Force is reporting that the overall modernization program is within its estimated cost and schedule. However, as shown in table I.1 of appendix I, 5 of the 9 projects have schedule delays ranging from 6 to 65 months. Until validation is formalized in written policy and routinely performed on each project, we do not believe the Air Force can support

its overall assessment of the program status. Moreover, it cannot ensure that it is providing the Congress with accurate and reliable information on the modernization effort.

Management Review and Documentation Requirements Not Always Enforced

Defense and Air Force regulations on automated system acquisitions identify specific reviews that should be conducted and documentation to be used to verify that each phase of development is completed before a project moves on to the next development phase. The following sequential reviews are required by this guidance:

- System Requirements Review. Ensures that system requirements will meet users' functional requirements and that there is mutual understanding between the user and the developer.
- System Design Review. Ensures that specifications have been developed to achieve system requirements.
- Product Verification Review. Ensures that the software developed meets the specifications and that preparations for testing are complete.
- System Validation Review. Ensures that the software satisfies the user functional requirements and that tests demonstrate the software is ready to be put into operation.

During these reviews, the Air Force requires that specific documentation be available to verify the successful completion of the review, provide a basis for management evaluation, and validate, to potential system users, that their requirements have been adequately translated into the system's design. (See appendix II for details of required reviews, their purpose, and documentation requirements.)

Project management reviews, designed to increase the likelihood that projects will meet cost, schedule, and performance goals, were not always held in proper sequence. In addition, decisions to continue development were made without using documentation necessary for system users to validate that their requirements had been properly stated and translated into the system design. While six of the projects were reviewed in the proper sequence, the evidence is unclear as to the extent to which the other three have undergone these reviews. In addition, none of the project managers have used the required documentation in support of their decisions to proceed to the next phase. As a result, project management cannot ensure project development phases were adequately completed before they were authorized to enter the next phase. This, we believe, increases the potential for cost increases, schedule slippages, and the development of systems that do not meet user needs.

Project managers gave various reasons why reviews were not held or why adequate documentation was not used to support their decisions. For example, a Requirements Data Bank project official said that reviews were not held during the first year of development because the Air Force was relying on the contractor to provide a fully operational system. He indicated that actions have been taken to correct the situation. In two other cases, project management officials for the Enhanced Transportation Automated Data System and Depot Maintenance Management Information System said that the reviews were held without the proper documents and that these documents were either in the process of being approved by Air Force officials or had not yet been developed.

Delegation of Procurement Authority Not Sought

One important objective of the Brooks Act of 1965 was the economic acquisition of general-purpose computer equipment for the federal government. To acquire general-purpose, mass-produced, commercially available computer equipment, a federal agency must submit an agency procurement request to General Services for review. After reviewing the request for completeness and compliance with its implementing regulations, General Services will either

- delegate authority to the agency to conduct the procurement;
- delegate authority to the agency to conduct the procurement with GSA participating in the procurement; or
- conduct the procurement itself with the agency's assistance, as needed.

In its fiscal year 1982 Defense Authorization Bill, the Congress adopted a provision, codified at 10 U.S.C. 2315, that changed the way in which Defense procures certain computer equipment and services. The language amounts to an exemption known as the Warner Amendment, which states:

"...(a) Section III of the Federal Property and Administrative Services Act of 1949 (40 U.S.C. 759) [the Brooks Act] is not applicable to the procurement by the Department of Defense of automatic data processing equipment or services if the function, operation, or use of the equipment or services (1) involves intelligence activities; (2) involves cryptologic activities related to national security; (3) involves the command and control of military forces; (4) involves equipment that is an integral part of a weapon or weapons system; or (5) subject to subsection (b) is critical to the direct fulfillment of military or intelligence missions "

Subsection (b) states:

"...subsection (a) (5) [previously stated] does not include procurement of automatic data processing equipment or services to be used for routine administrative and business applications (including payroll, finance, logistics, and personnel management applications) "

As stated in our May 1986 report,¹¹ we understand this to mean that if the proposed use of the equipment or services is for routine administrative or business applications, the procurement is subject to the requirements of the Brooks Act. The procurement is not subject to the requirements of the act if the equipment is (1) to be used for intelligence, cryptological, or command and control activities; (2) an integral part of a weapons system; or (3) a system which is critical in providing direct support of a military and intelligence mission.

In a February 1982 memorandum, Defense issued interim direction on compliance with the Warner Amendment and established a working group of senior personnel to revise amendment guidelines. This interim direction identified computer equipment and services to be acquired under the Warner Amendment and the Brooks Act. Specifically, "inventory/stock control, storage depot, and base-level systems" were identified as not included in the Warner Amendment; the computer equipment and services for these systems had to be acquired under the Brooks Act.

About a year later, Defense issued its "DOD-Wide Guidelines for Acquiring Computer Resources Under 10 U.S.C. 2315." This guideline exempted from the Brooks Act "logistics systems which provide direct support to operating forces or provide direct support to maintenance of weapons systems."

In its latest guidance (November 1984), Defense distinguishes between logistics applications that are for "routine administrative and business applications" (as specified in subsection (b) of the Warner Amendment) and those that are, based on the functions to be performed, "critical to the direct fulfillment of a military or defense mission." Routine logistics applications are defined to include systems that support "contracting, accounting, disbursement, and budget, etc."

In initiating the LMS program, the Air Force did not seek a delegation of procurement authority from General Services. The Air Force's stated position was that the modernization program projects were subject to the provisions of the Warner Amendment and, thus, exempt from the

¹¹Computer Buys: Air Force Logistics Modernization Program Should Comply with Brooks Act (IMTEC-86-16, May 15, 1986).

Brooks Act. As stated in our May 1986 report, we believe that even under the Warner Amendment, where LMS procurements were for rou-tine logistics applications, the Air Force should have complied with the Brooks Act and the implementing regulations of General Services.

In the continuing resolution for fiscal year 1987 (Public Law 99-591), the Congress revised the wording of the Brooks Act by adding a new section providing exemptions for certain specified military and intelligence computer systems and software but stated, with respect to mission critical systems, "...that this exclusion shall not include automatic data processing equipment used for routine administrative and business applications such as payroll, finance, logistics, and personnel management;..." This exemption is identical to the language of the Warner Amendment, except that the new statute uses the phrase "such as" in place of the word "including." The major change made by Public Law 99-591 is that it gave the General Services Administration's Board of Contract Appeals specific authority, in reviewing decisions of contracting officers protested to the Board by protestors, the right to determine whether the disputed procurement is subject to the Brooks Act.

The fact that the Congress changed the word "including" to "such as" in Public Law 99-591 without amending the parallel language in the Warner Amendment in Title 10, does not indicate that all logistics systems critical to the direct fulfillment of military or intelligence missions are, by definition, routine administrative or business systems subject to the Brooks Act. However, the ultimate authority for determining this question now rests with the General Services Administration's Board if the question comes before it under a bid protest.

Thus, the full impact of this revision is yet unknown. Defense has not issued a position statement on the new legislation, but expects to do so sometime during fiscal year 1987. General Services did not have first-hand knowledge of the current facts pertaining to the LMS program because Defense initially determined which procurements fell within the Warner Amendment. General Services did, however, based upon the information in our May 1986 report, agree that the Air Force should follow the process established under the Brooks Act for buying automatic data processing equipment and services. In any event, if the Air Force had requested procurement authority, the modernization projects would have received an independent review from General Services. This review could have identified actions to improve planning and thus reduced development risks to the modernization projects. In addition, if

a disappointed firm protests a future contract award to the General Services' Board of Contract Appeals—or to the General Accounting Office—either may find that a delegation is required. This might result in program delays that the Air Force could have avoided by seeking delegations before taking further contract action.

Conclusions and Recommendations

Conclusions

In planning its current modernization program, the Air Force Logistics Command designed an acquisition strategy that addresses the major causes it attributed to the failure of ALS. Whether this strategy is sufficient to prevent another ALS-type failure is unknown, but we believe that the risk of such a failure has been reduced.

However, because the Air Force initiated its modernization projects without completing initial planning activities, it has increased the risk of cost increases, schedule delays, and ineffective performance. Initial planning is critical for defining and resolving operational deficiencies, clearly stating benefits to be achieved, and measuring project success. Without such information, the Air Force cannot ensure it made optimum early project decisions that shape system cost and usefulness. Also, the Air Force cannot effectively analyze cost versus benefits or evaluate system capabilities. This is a critical deficiency because the Congress endorsed these projects based on the Air Force's assertion of readiness and logistics support improvements. Without a mechanism to compare cost and benefits, the Congress has no basis on which to determine the value of the LMS program and no assurance that the alternatives selected will result in the most effective systems at the least cost.

If the Air Force had sought a delegation of procurement authority from the General Services Administration for each of the modernization projects, each would have received an independent review. In addition, due to the Brooks Act revision by Public Law 99-591, the Air Force's failure to obtain delegations of procurement authority before exercising existing contract options, renewing contracts, or awarding new contracts could, if protested to the General Services Administration's Board of Contract Appeals, result in a decision that such actions require Brooks Act delegations.

The Air Force has taken positive actions on some projects which we believe will, in part, make up for the planning weaknesses discussed in this report and, thus, should improve these projects' chances for success. Although such actions should have been completed prior to project development, their completion can reduce project cost, schedule, and performance risks. One example pertains to the Contracting Data Management System project. This project's officials have initiated an information engineering study that they expect will save considerable development time and help ensure that the completed system meets user needs. On the basis of our suggestion, project officials also agreed to, after the engineering study has been completed, explore the use of the

Air Force Systems Command's existing Acquisition Management Information System as a potentially less costly alternative to the proposed Contracting Data Management System development. Another example where the Air Force has taken positive action pertains to the Stock Control and Distribution project. Recognizing the importance of measuring system success, officials of this project have developed a systematic method to measure actual versus expected benefits.

The Air Force can further reduce development risks by strengthening project management's ability to quickly identify development problems and implement corrective action. Although the Air Force is relying extensively on contractors to successfully develop the current modernization projects, it has not taken the actions it should to better control contractor status reporting and overall performance. Half the software contracts lack control provisions to avoid common development problems, cost and schedule information is not always required and routinely validated, and project reviews are made without information needed to support go/no-go decisions. Unless the Air Force takes action to better control contractor status reporting, to strengthen project management, and to measure system effectiveness, actual LMS modernization project costs may greatly exceed current estimates, benefits may not materialize, and the systems may not perform as planned.

Recommendations

We recommend that the Secretary of the Air Force direct the Commander of the Air Force Logistics Command to take the following actions for the nine modernization projects:

- Precisely define the existing problems in the Command's operations and document how the Command will ensure that the system being developed will correct these deficiencies to meet mission requirements. Deficiencies and user needs should be expeditiously defined for the seven development projects already under contract and defined for the remaining two projects prior to awarding any contracts. Feasible alternatives should also be identified and fully evaluated prior to awarding contracts for these two projects. Specifically, the Air Force Systems Command's Acquisition Management Information System should be fully assessed as an alternative to developing the new Contract Data Management System being proposed by the Logistics Command.
- Clearly define expected benefits and establish specific criteria to measure achievement of these benefits. The Air Force should identify specific budget line items where logistics support savings or precise readiness improvements, or both, will result. It should establish system

effectiveness criteria and measurement methods in an evaluation plan during early system development. This plan should provide direction and guidance to development contractors and should be used by Air Force project managers to evaluate contractor performance and to ensure that benefits are being achieved.

- Establish and incorporate provisions for measurable tasks, development milestones, and quality assurance into the two development contracts which have not yet been awarded. For the seven projects already under development contract, determine whether amendments can be made in these areas to increase Air Force control over contractor performance.
- Strengthen program oversight procedures to ensure that project management rigorously enforces review and documentation requirements and records and shares lessons learned with other project managers.
- Establish cost and schedule tracking mechanisms which accurately reflect contractor performance and, as a control mechanism, routinely validate the reliability of this information. When established cost and schedule thresholds have been exceeded, the Secretary of the Air Force should report changes in individual project cost and schedule estimates resulting from these validation efforts to the Secretary of Defense and to the Congress.

In addition, in order to avoid potential program delays, we recommend that the Secretary of Defense direct the Secretary of the Air Force to ensure that the Air Force Logistics Commander does not exercise any contract options, renew any contracts, or award any contracts for the modernization projects until a delegation of procurement authority is obtained from the General Services Administration.

Air Force Logistics Management Systems Modernization Program—Summary Information for Individual Projects

This appendix includes summary information on the nine individual projects composing the Air Force Logistics Management System Modernization program (LMS). The individual summary sheets include Air Force information on each project's (1) description, (2) importance, (3) costs and benefits, (4) acquisition strategy, and (5) current status. The risk assessment section of each project summary sheet includes our general observations on whether Air Force initial planning activities, project management, and control procedures have, in our view, increased or decreased development risks. This section also includes our observations, if any, on the status of individual projects.

Tables I.1 and I.2 summarize cost and schedule information for each of the nine projects. The tables contrast the Air Force's current cost and schedule estimates with the original estimates given to Defense's Major Automated Information Systems Review Council at the outset of the program. Table I.2 also shows the funds obligated for each project as of February 1987.

Table I.1: LMS Project Schedules

Project	Original estimated completion (As of Jan. 1985)	Revised estimated completion (As of Feb. 1987)	Change in schedule Jan. 1985 to Feb. 1987 (months)
Requirements Data Bank	Apr. 1989	Sep. 1994	65
Weapon System Management Information System	Sep. 1987	Sep. 1987	0
Contracting Data Management System	Sep. 1990	Jun. 1990	(3)
Stock Control and Distribution System	Jan. 1989	Jan. 1989	0
Enhanced Transportation Automated Data System	Dec. 1986	Sep. 1987	9
Depot Maintenance Management Information System	Feb. 1989	Oct. 1990	20
Engineering Data Computer Assisted Retrieval System	Feb. 1987	Oct. 1987	8
Local Area Network	Jul. 1990	Jul. 1990	0
Intersite Gateway	Dec. 1987	Jun. 1988	6

Appendix I
Air Force Logistics Management Systems
Modernization Program—Summary
Information for Individual Projects

Table I.2: LMS Project Acquisition Cost Estimates

Dollars in millions

Project	Original Jan. 1985 estimated acquisition costs	Revised Feb. 1987 acquisition cost	Obligations as of Feb. 1987	Change in cost from Jan. 1985 to Feb. 1987
Requirements Data Bank	\$139.6	\$151.0	\$91.3	\$11.4
Weapon System Management Information System	48.7	46.0	34.1	(2.7)
Contracting Data Management System	35.3	48.2	4.3	12.9
Stock Control and Distribution System	205.0	187.6	79.3	(7.4)
Enhanced Transportation Automated Data System	5.5	10.9	6.3	5.4
Depot Maintenance Management Information System	85.4	106.2	16.5	20.8
Engineering Data Computer Assisted Retrieval System	35.0	32.7	29.7	(2.3)
Local Area Network	161.4	127.3	66.7	(34.1)
Intersite Gateway	22.0	18.0	16.2	(4.0)
Total LMS	\$737.9^a	\$737.9^a	\$344.4	0

^aDoes not include \$53.7 million for three support program costs and one canceled project.

Project Summary Sheet Requirements Data Bank

Description

- Distributive processing system with multiple data bases.
- 19 batch systems with many manual processes eliminated.

Importance

- Computes worldwide materiel requirements for spare and repair parts, equipment, and depot resources.
- Prepares budget forecasts and program objective memorandum submissions.
- Provides information for strategic and directive level planning, programming, budgeting, and resource allocation decisions affecting weapon system war readiness capabilities.
- Provides "what if" query capability for assessing the impact of logistics policy and allocation decisions.

Costs and Benefits

Acquisition cost of \$151.0 million.

Life cycle cost of \$369.5 million.

Benefits totaling \$6.3 billion over 8-year life as follows:

- Tangible¹² (2 benefits):
 - One-time reduction of \$89.8 million in replenishment spares safety level.
 - Recurring reduction of \$145 million in inappropriate procurements.
- Intangible¹³ (10 benefits):
 - Addition of 175 fully mission-capable aircraft valued at \$2.7 billion.
 - \$5.3 million annually in manual resource allocation control.
 - \$3.0 million annually in manual budget preparation and long-range forecasting.
 - \$5.3 million annually in manual data input, edit control, and system interfaces.

¹²Tangible benefits - benefits which can be quantified and may represent budget reductions.

¹³Intangible benefits - benefits which may or may not be quantified, but which do not represent budget reductions.

- \$210 million annually for improved budget and Program Objective Memorandum forecasting.
- \$68 million annually for improved repair accuracy.
- Directive level management (7 to 10 days versus 14 to 120 days).
- Budget preparation (1 to 3 months versus 6 to 9 months).
- Program Objective Memorandum preparation (1 to 3 months versus 8 to 9 months).
- Item procurement and repair (7 to 10 days versus 14 to 120 days).

Acquisition Strategy

- Contractor to define, design, develop, test, maintain, and modify application programs.
- Modular development (9 step project logical application groups, each divided into segments).
- Incremental implementation over 5 years.
- Use of mature, commercially available hardware and system software.
- Cost-plus-award-fee development and maintenance contract with 11 annual options.
- Project management office responsible for system development.

Current Status

- Development contractor: BDM Corporation, (cost plus award fee).
- Independent validation and verification contractor: Systems and Applied Sciences Corporation (cost plus fixed fees).
- Portions of 2 of 19 systems are complete.
- Final completion date delayed from September 1989 to mid-1994, however, no additional acquisition costs will be incurred other than \$5.3 million for inflation.

GAO Risk Assessment

- Increased development risk due to:
- Feasibility study fully defining existing deficiencies in terms of operational impacts and full explanation of alternative solutions was not done.
 - Criteria and method to guide early decision and measure project success was not established.
 - Contractor control provisions to manage contractor performance was not sufficient.
 - The project management review discipline, especially for early segments, was not strictly adhered to.

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Air Force Logistics Management Systems
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- Complete and accurate cost and schedule reporting not provided. Acquisition cost estimate seems questionable given that 58 percent of the estimated costs have been obligated and only portions of 2 of 19 systems have been completed.

Project Summary Sheet Weapon Systems Management Information System

Description

- Provide a new capability not previously automated.
- Improves management visibility of aircraft status.

Importance

- Primary objective, logistically assess the ability of weapons systems to conduct effective combat missions.
- Identifies logistics resources limiting wartime capability and corrective actions.
- Estimates number of wartime aircraft available.
- Estimates combat missions that can be supported in the initial period of war.
- Allows logistics managers to analyze various alternatives and to select the best approach to solve problems.
- Milestones for get well plans can be tracked.

Costs and Benefits

Acquisition cost of \$46.0 million.

Life cycle cost of \$115.5 million.

Benefits totaling \$0 as follows:

- Tangible (no benefits).
- Intangible (12 benefits).
 - Increase in mission capability by 2-3 percent.
 - Increase fully mission capable rate by 6 percent.
 - A 50 percent reduction in the time that line replaceable units are down.
 - More efficient acquisition of spare parts by converting information from item management to weapon system management.
 - From 60-90 days to 1-7 days faster identification of supply and maintenance problems.
 - A 50 to 75 percent reduction in time needed to perform cost avoidance analysis and weapon system readiness problem analysis.
 - Increase in timeliness of information.
 - Timely feedback on logistics supportability.

Appendix I
Air Force Logistics Management Systems
Modernization Program—Summary
Information for Individual Projects

- Attain specific mission generation goals.
- Resolve 92 to 100 percent of the problems before wartime activities begin.
- Increase in achievement of specified weapon system support goals.
- Increase in morale due to system improvements.
- An estimated \$2.0 billion in fly-away savings per weapon system. (Not categorized as either tangible or intangible.)

Acquisition Strategy

- Three module approach.
- Developed and implemented over 5 year period.
- All contracts firm fixed price.
- Each module prototyped and then implemented.

Current Status

- Development contractors: Dynamics Research Corporation, Synergy Incorporated and the Analytical Sciences Corporation, (all firm fixed price).
- Independent validation and verification contractor: Computer Software Analysts Corporation, (firm fixed price).
- All three modules have achieved initial operating capability status.
- Full operating capability scheduled for fourth quarter of fiscal year 1987.

GAO Risk Assessment

- Risk of failure for any of the modules is low.
- Although the get well assessment module is categorized as having achieved initial operating capability, we found this was not true at the two Air Logistics Centers we visited. This increases the risk of cost and schedule overruns.

Project Summary Sheet Contracting Data Management System

Description	<ul style="list-style-type: none">• Replaces nine systems performing the acquisition function.
Importance	<ul style="list-style-type: none">• Will replace a manual system with an automated system for contract administration.
Costs and Benefits	<p>Acquisition cost of \$48.2 million.</p> <p>Life cycle cost of \$93.0 million.</p> <p>Benefits total \$2.0 billion over 8-year life as follows:</p> <ul style="list-style-type: none">• Tangible (no benefits).• Intangible (13 benefits).<ul style="list-style-type: none">• \$228 million annually in reduced logistics pipeline.• \$27,000 annually in reduced time sharing use.• \$17 million annually in improved buyer and analyst productivity.• Increased capacity to handle wartime surges in use.• Improved pricing of spare parts.• Provides Military Standard Contract Administration Procedures compatibility.• Reduction in errors.• Immediate access to current management information.• Accessibility of Air Logistics Center data by Headquarters, Air Force Logistics Command.• Reduction in system interfaces.• Automation of processes within the competition advocacy program.• Ease of maintenance and/or modification.• One data system with a consistent data set.
Acquisition Strategy	<ul style="list-style-type: none">• A two phase, 4-year development.• Combination firm-fixed-price and cost-type contract.

Current Status

- Development contractors: Phase I, Integrated Microcomputer Systems Incorporated (firm fixed price/cost plus award fee); Phase II, to be determined.
- Independent validation and verification contractor: to be determined.
- Phase I is in the development phase.
- Phase II contract to be awarded in mid-1987.
- Final completion date scheduled for mid-1990.

GAO Risk Assessment

- Although the Air Force completed two feasibility studies for the project, neither adequately analyzed the Air Force Systems Command's Acquisition Management Information System as a viable alternative.
- The information engineering study for Phase II, if properly executed, significantly reduces the risk of failure and better assures that the system will be within budget and will meet user needs.
- The Phase I contract's lack of quality assurance provisions increases the risk that the system will not meet requirements or be delivered on time and within budget.
- Inadequate expected benefits reduce the Air Force's ability to evaluate system effectiveness.

Project Summary Sheet Stock Control and Distribution

Description	<ul style="list-style-type: none">• Replaces 21 data systems.
Importance	<ul style="list-style-type: none">• Controls the storage, allocation, and movement of inventories.• Processes requisitions and reports item status to customers.
Costs and Benefits	<p>Acquisition costs of \$197.6 million.</p> <p>Life cycle costs are estimated at \$365.2 million.</p> <p>Benefits total \$14.4 million in tangible savings and \$3.6 billion in intangible savings.</p> <ul style="list-style-type: none">• Tangible (1 benefit):<ul style="list-style-type: none">• One-time savings of \$14.4 million for pipeline reduction in recoverable aircraft spares.• Intangible (2 benefits):<ul style="list-style-type: none">• Increased Air Force readiness equal to 107 additional aircraft valued at \$1.4 billion.• Operating costs totalling an additional \$2.2 billion over 10 years.
Acquisition Strategy	<ul style="list-style-type: none">• Competitive prototype selection of a single contractor, who is required to acquire, develop, test, maintain, and modify computer equipment and application programs.• Development divided into three tracks implemented over 3.5 years with final operating capability of production system scheduled for January 1989.• Project evolving as requirements are defined.• Program management office established to apply management policies and procedures.• Cost-plus-award-fee contract for software development; firm fixed price for computer equipment acquisition portion.

Current Status

- Development contractor: Computer Sciences Corporation (firm fixed price/cost plus award fee).
- Independent validation and verification contractor: to be determined (firm fixed price).
- Development contractor reworked his schedule to reflect a 6 month slippage in the initial operating capability of the prototype system. (Final operating capability, however, has not changed.) The Command attributes the slippage to poor performance of the independent validation test contractor and to the addition of new requirements from the Department of Defense.
- Original independent validation test contractor replaced.
- Development contractor experiencing increased costs associated with the delay in development of the prototype system (specific costs were not identified).

GAO Risk Assessment

- Increased development risk due to:
 - Feasibility study fully defining existing deficiencies in terms of operational impacts and full explanation of alternative solutions was not done.
 - Criteria and method to guide early decision and measure project success was not established.
 - Redefinition of system requirements occurring in mid-development.
 - Slippage in interim milestones occurring without recognition of a delay to the total project.
- Decreased risks because project office established a benefit tracking system.

Project Summary Sheet

Enhanced Transportation Automated Data System

Description

- Data base management system.
- Eliminates manual systems and three existing systems.

Importance

- Provides more effective visibility and control of logistics in transit assets.
- Improves the ability to reposition materiel to meet peace and wartime commitments.
- Manages and controls the Logistics Airlift System and scheduled truck service within the contiguous United States.
- Monitors and controls Air Force export cargo by airlift and sealift.
- Manages and controls the centrally managed allotment for Air Force transportation funds.

Costs and Benefits

Acquisition cost of \$10.9 million.

Benefits totaling \$5 million in savings over 8 year life as follows:

- Tangible (0 benefits).
- Intangible (5 benefits).
 - One-time reduction - \$5 million safety factor.
 - Eliminates punched cards.
 - Centralizes transportation funds.
 - Gives visibility and flexibility to reposition materiel.
 - Improves the accuracy of transportation data.

Acquisition Strategy

- Contractor to propose, acquire, develop, test, and deliver a ready for use, turn-key system.
- Modular development composed of 4 subsystem segments over a 1 1/2 year period.
- Mature, commercially available hardware and system software.

- Cost-plus-fixed-fee contract.
-

Current Status

- Development contractor: Automated Sciences Group Incorporated (cost plus fixed fee).
 - Independent validation and verification contractor: none.
 - Negotiating to change from cost-plus to firm-fixed-price contract.
 - Subsystem segments 2, 3, and 4 being developed.
 - Final completion date delayed from January 1987 to September 1987.
-

GAO Risk Assessment

- Increased development risk due to:
 - Feasibility study fully defining existing deficiencies in terms of operational impacts and full explanation of alternative solutions was not done.
 - Criteria and method to guide early decision and measure project success were not established.
 - Complete and accurate cost and schedule reporting is not being provided. Project was near completion before the Air Force realized it could not meet estimated cost and schedule.
 - The project management review discipline, especially for earlier segments, was not strictly adhered to.

Project Summary Sheet Depot Maintenance Management Information System

Description

- Replaces 45 existing systems performing depot repair functions.
- Will integrate the management of depot repair functions.

Importance

- Improve depot efficiency by optimizing the use of maintenance resources, provide greater scheduling efficiencies, more evenly distribute workloads, and identify work in process for only those items actually being worked.

Costs and Benefits

Acquisition cost of \$106.2 million.

Life cycle cost of \$213.7 million.

Benefits totaling \$673.6 million over 8-year life as follows:

- Tangible (1 benefit).
 - \$973,616 annually in out/put/microfiche.
- Intangible (17 benefits).
 - \$423,350 annually in support costs.
 - \$8.0 million annually in information processing and system support tasks.
 - \$19,000 annually in direct labor delay hours avoided.
 - \$22.0 million annually reduced pipeline inventory.
 - \$399,000 annually in non-reimbursed turn ins and incorrect materiel movements.
 - \$53 million annually in increased productivity.
 - \$363,000 annually in reduced modification cost.
 - \$395,000 annually in reduced current system operations.
 - \$180,300 annually in incremental data automation request handling.
 - \$4.8 million annually in reduced computer time and operation support.
 - Improvements in prices/rates.
 - Reduced system modification lead time by 1 day.
 - Increased visibility of scheduling, materiel control, and production functions.

- Increased timeliness of maintenance situation reports.
 - Reduce data entry errors by 75 percent.
 - Sound basis for rapid work load changes.
 - Increased morale.
-

Acquisition Strategy

- Three phased development over 7 years.
 - Phase I was for sole-source hardware only.
 - Phase II and III will be a fixed-price contract for the remainder of development.
 - Commercially available manufacturing resource planning software will be modified for the Command's requirements.
 - Request for Proposals includes requirement that contractor conduct an information engineering study.
-

Current Status

- Development contractor: to be determined (fixed price).
 - Independent validation and verification contractor: to be determined.
 - Air Force Audit Agency and Independent Cost Assessment show that current funding estimates are low.
 - Phase I has been implemented at four of five Air Logistics Centers.
 - Phase II and III contract award has been slipped from June 1987 to December 1987.
-

GAO Risk Assessment

- Commercially available software and hardware reduce technical risk.
- Users seem pleased with Phase I operation.
- Phased approach reduces risk of total failure.
- Information engineering requirement reduces risk of failure if study is well executed.
- Change from cost-plus to fixed-price contract reduces government's cost risk.
- Phase I sole-source hardware purchase increases cost risk.

Project Summary Sheet Engineering Data Computer Assisted Retrieval System

Description	<ul style="list-style-type: none">• Replaces inefficient manual system of storing engineering drawings.
Importance	<ul style="list-style-type: none">• Automates the receipt, requisitioning, indexing, filing, retrieval, and distribution of engineering drawings.• Paperless repository will allow for the rapid availability of drawings for maintenance modification and engineering evaluation.
Costs and Benefits	<p>Acquisition cost of \$32.7 million at January 1987.</p> <p>Life cycle cost of \$79.7 million.</p> <p>Benefits totaling \$29.2 million over 8-year life as follows:</p> <ul style="list-style-type: none">• Tangible (1 benefit):<ul style="list-style-type: none">• Annual savings of \$504,334 due to reduced files and the elimination of the fund required to replace missing data.• Intangible (3 benefits):<ul style="list-style-type: none">• Annual savings of \$698,379 due to reduced walk and wait time.• Cost avoidance totalling \$2.5 million over the life cycle due to the method of equipment replacement.• Cost avoidance totalling \$17.1 million in reduced spare part procurement.
Acquisition Strategy	<ul style="list-style-type: none">• Joint Army/Air Force development managed by the Army.• Service defined performance specifications.• Contractor to acquire, develop, maintain, warrant, and modify application programs and hardware.• Implementation over 3 years.• Firm-fixed-price contract with 113 options over a 5-year period beginning in 1984.

**Appendix I
Air Force Logistics Management Systems
Modernization Program—Summary
Information for Individual Projects**

Current Status

- Development contractor: American Telephone and Telegraph Technologies (firm fixed price).
- Independent validation and verification contractor: none.
- Initial operating capability achieved in October 1986.
- As of January 1987 the project was in the test phase with the Command reporting that the system was meeting all specifications.
- Schedule has slipped 5 months resulting from software problems experienced in May 1986.

GAO Risk Assessment

- Project is near completion.

Project Summary Sheet Local Area Network

Description	<ul style="list-style-type: none">• Full star network with multiple protocols.• Does not replace any existing systems.
Importance	<p>Connects LMS systems together.</p> <p>Supports management access to multiple computers.</p>
Costs and Benefits	<p>Acquisition cost of \$127.3 million.</p> <p>Benefits with no quantified dollar savings over 8-year life as follows:</p> <ul style="list-style-type: none">• Tangible (0 benefits)• Intangible (6 benefits)<ul style="list-style-type: none">• Timely user access to needed information.• Orderly transition from batch to on-line processing.• Reduction in demand for base cable.• Uninterrupted communication support during staff relocation.• User access to multiple computer communication.• Supports both terminal to computer and computer to computer data transfer.
Acquisition Strategy	<ul style="list-style-type: none">• Contractor to verify government-provided cable plan design and specifications for buildings, and install, integrate, and test the hook-ups.• Modular development (5 block segments).• Incremental implementation over 5 years.• Firm-fixed-price contract.
Current Status	<ul style="list-style-type: none">• Development contractor: TRW Defense Systems (firm fixed price).• Independent validation and verification contractor: none.• Completed block 1; blocks 2 and 4 are on contract; blocks 3, 4, and 5 schedules have slipped several months.• Final completion date still scheduled for late 1990.

GAO Risk Assessment

- Increased development risks due to:
 - Feasibility study fully defining existing deficiencies in terms of operational impacts and full explanation of alternative solutions was not done.
 - Criteria and method to guide early decision and measure project success were not established.
 - Block 2 completion delayed due to engineering changes to design and installation. Changes estimated to cost \$7.8 million.
 - Strict adherence to the project management review discipline especially for earlier segments was not followed.

Project Summary Sheet Intersite Gateway

Description	<ul style="list-style-type: none">• On-line transmission and distribution of incoming and outgoing messages and transactions.• New requirement does not replace any existing systems.
Importance	<ul style="list-style-type: none">• Provides a flexible, on-line intersite communications system to support the LMS projects between sites.
Costs and Benefits	<p>Acquisition cost of \$18 million.</p> <p>Benefits with no quantified dollar savings over 8-year life as follows:</p> <ul style="list-style-type: none">• Tangible (0 benefits)• Intangible (7 benefits)<ul style="list-style-type: none">• Transition from batch-oriented to on-line systems.• A communication path to distributed data.• On-line access to Defense Data Network.• On-line access to Automatic Digital Network.• Timely access to remote management data.• Increased ability to respond to surge/contingency workload.• Transmission of bulk data.
Acquisition Strategy	<ul style="list-style-type: none">• Two separate gateways with two different contractors.• One contractor to develop software, implement working prototypes, and perform integration tasks.• The other contractor to provide hardware, operating system software, communications software, and training.• Prototype development.• Developed and implemented over 3 years at six sites.• Commercially available hardware and system software.• Firm-fixed-price contract with options for maintenance.
Current Status	<ul style="list-style-type: none">• Development contractor: ARINC Research Corporation (firm fixed price), another to be determined.

**Appendix I
Air Force Logistics Management Systems
Modernization Program—Summary
Information for Individual Projects**

- Independent validation and verification contractor: none.
 - Prototype system is operational for one gateway.
 - Hardware delivery complete and installed for the other gateway.
 - Final completion date delayed from December 1987 to June 1988.
-

GAO Risk Assessment

- Increased development risk due to:
 - Feasibility study fully defining existing deficiencies and alternative solutions was not done.
 - Criteria and method to guide early decision and measure project success was not established.
 - Strict adherence to the project management review discipline, especially for earlier segments, was not followed.

Air Force Review and Documentation Requirements

Review name	Review purpose	Documentation requirements	Review timing
System Requirement Review	<p>-To assure the user that the project's progress is responsive to the approved requirements and to determine initial direction of the design effort.</p> <p>-To ensure the project is within its original limits.</p> <p>-Establishes the functional baseline which serves as a basis for mutual understanding between the user and developer, provides performance requirements and user impacts including costs, and a basis for test development.</p> <p>-Initiates configuration management of the functional description.</p>	<p>-Data Automation Requirement</p> <p>-Data Project Directive</p> <p>Data Project Plan</p> <p>-Economic Analysis</p> <p>-Draft Functional Description</p>	Marks the end of the conceptual development life-cycle phase and the beginning of Definition phase
System Design Review	-Establishing the system specifications for individual computer programs.	<p>-Functional Description</p> <p>-System Specification</p> <p>-Draft Performance Specifications</p> <p>-Data Project Plan</p>	Marks the end of the Definition development phase and beginning of the Development phase.
Product Verification Review	-Establishes the product baseline and to ensure preparations for the testing have been completed.	<p>-Test plans</p> <p>-Test preparations and schedules</p>	Marks the end of the Development phase and beginning of the Test phase.
System Validation Review	-Ensures that the automatic data system satisfies the requirements of the system specifications and Functional Description	<p>-PVR minutes</p> <p>-Test Report</p> <p>-Technical documents as required</p> <p>-Configuration management records as required</p>	-Completes the Test phase and initiates the Operation phase.

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